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REMARKS/ARGUMENTS

Claim 1, 2, 3, 5 - 11 have been amended. Claim 4 remains in this application. No new matter has been added.

Briefly, applicants wish to point out the major features of their claimed invention which is a novel method and apparatus for simultaneously polishing a plurality of substrates and conditioning the polishing medium on the surface of a polishing pad. The instantaneousness of substrate polishing and pad conditioning provides the CMP process a synergy for controlling the polishing of larger diameter substrates .

A plurality of coaxial polishing-dressing head devices, holding large substrates to be polished are rotated along its central axis while pressing the substrates within an outer radial segment of the rotating polishing pad. A pad dressing ring is mounted coaxially encircling each of the substrate supporting heads. The applied compression on the substrate supporting heads pushes the substrate and the coaxially mounted dressing ring against the upper surface of the polishing pad, hence, polishing a substrate while, at the same time, dressing the polishing pad.

Reconsideration of the rejection of Claims 1-4 and 8-11 under 35 U.S.C., 103(a), as being unpatentable over Hempel, Jr. (USP 5,895,270 in view of Aiyer (USP 6,302,770), is requested, in light of the following arguments.

As noted by the Examiner, Hempel, Jr. fails to teach a coaxial polishing dressing head assembly as described in the claimed invention. There are other differences as well. Hempel, Jr. teaches two CMP embodiments, each having multiple polishing and buffing stations. A first embodiment using a vertical processing arrangement and a second using a horizontal

processing arrangement. Both use smaller polishing platen diameters inflicting process constraints such as, decreasing the useful life of the polishing pad, while generating heat during polishing because of a smaller diameter polishing platen.

While Aiyer teaches a pad conditioner and polisher, that is, as the wafer is lowered for polishing, the pad conditioner mechanism is raised, and vice versa. The frequency of this exchange has an influence on the overall polishing cycle, that is, if it is too long between exchanges, the surface of the polishing pad will harden into a glaze finish that precludes polishing, if it is too short, it increases the polishing cycle.

This contrasts with the claimed invention in which a coaxial polishing-dressing apparatus as claimed in amended Claim 1, lines 5-18, a polishing-dressing head for a polishing apparatus that includes a plurality of substrate head assemblies. Each having a lower nesting surface opposed to an upper surface of a polishing pad. The lower nesting surface releasably holds a substrate to be polished while rotating along a central axis and polishing the substrates on an outer radial portion of the rotating polishing pad.

More importantly, annular dressing rings for dressing the polishing pad are positioned coaxially encircling each nested substrate. The annular dressing rings are removably attached to the lower surface of the substrate head assemblies. This embodiment provides for a concurrent application of pressure, for simultaneous polishing of the substrate and dressing the polishing pad by urging the substrate head assemblies against the upper surface of the rotating polishing pad.

The annular dressing rings of claim 1, and the manner in its application as illustrated

in Figs. 4, 5 and 6, are neither taught nor suggested by the prior art.

Reconsideration of the rejection of Claims 5 and 7 under 35 U.S.C., 103(a), as being unpatentable over Hempel, Jr. (USP 5,895,270 in view of Aiyer (USP 6,302,770), in further view of Shimizu et al. (USP6,176,762) is requested, in light of the following arguments.

The arguments of Hempel, Jr., Aiyer were presented above. As noted by the Examiner, neither teaches a dresser ring comprising ceramic Shimizu et al., are directed towards the cutting of a ceramic base plate. Shimizu et al. bonds a ceramic base plate to one end of a supporting plate while dressing the supporting plate and the ceramic base plate, simultaneously cutting the supporting plate to a certain depth. This process describes a machining technique analogous to that practiced in a machine shop.

The annular dressing rings of claim 1, and the manner in its application as illustrated in Figs. 4, 5 and 6, are neither taught nor suggested by the prior art.

Reconsideration of the rejection of Claim 6 under 35 U.S.C., 103(a), as being unpatentable over Hempel, Jr. (USP 5,895,270 in view of Aiyer (USP 6,302,770), in further view of Shimizu et al. (USP6,176,762), as evidenced by Erickson (USP 6,080,216) is requested, in light of the following arguments.

The arguments of Hempel, Jr., Aiyer and Shimizu were presented above. As noted by the Examiner, neither teaches a glass frit binder. The use of inclusions of a glass frit binder in a ceramic substrate to construct an annular dressing ring is an engineering application taught

in materials science courses.

This contrasts with the claimed invention in which a coaxial polishing-dressing apparatus as claimed in amended Claim 1, lines 5-18, which includes a plurality of coaxial polishing-dressing head assemblies each having a lower nesting surface opposed to an upper surface of the polishing pad on the polishing platen, a nesting means releasably holding a substrate to be polished, the coaxial assembly rotates along a central axis thereof, while pressing the substrates on a radial portion of the rotating polishing pad. Dressing rings for dressing the polishing pad are positioned coaxially encircling each nested substrate, the dressing rings are removably attached to the lower surface of a plurality of substrate nesting support heads, with compressing means for applying a polishing and dressing pressure to the coaxial polishing-dressing head assemblies. The substrate polishing-dressing head assemblies are pressed against the upper surface of the polishing pad.

The annular dressing rings of claim 1-11, and the manner of its application as illustrated in Figs. 4, 5 and 6, are neither taught nor suggested by the prior art.

Furthermore, it is respectfully suggested that the combination of these references cannot be made without reference to Applicant's own invention. None of the applied references address the problem of increasing machine throughput by consolidating substrate polishing with pad dressing while doing it simultaneously with a plurality of wafer supporting head assemblies. Applicant has claimed his process in detail. The processes of Figs. 3-6 (Claims 1-11) are believed to be novel and patentable over the various references, because there is not sufficient basis for concluding that the combination of claimed elements would have been obvious to one skilled in the art. That is to say, there must be something in the

prior art or line of reasoning to suggest that the combination of these various references is desirable. We therefore request Examiner MacArthur to reconsider her rejection in view of these arguments and the amendments to the Claims.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned.

"Version with markings to show changes made."

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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BY



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VERSION WITH MARKINGS TO SHOW CHANGES MADEIn the Claims:

Please amend claims 1, 2, 3, and 5-11 as follows:

1.(TWICE AMENDED) A [coaxial] polishing-dressing head for a polishing
apparatus comprising:

[a polishing platen having an upper surface on which a polishing pad is
affixed, said polishing platen being rotated in one direction along a 5
central axis thereof;]

a plurality of [coaxial polishing-dressing] substrate head assemblies each
having a lower nesting surface opposed to an upper surface of [the] a
polishing pad [on said polishing platen], said [a] lower nesting [means]
surface releasably holds [ing] a substrate to be polished, said [coaxial]
substrate head assemb[ly means]]ies, each rotating along a central axis
thereof and [pressing] polishing the substrates on an outer radial portion
of said rotating polishing pad;

annular dressing rings for dressing said polishing pad, said dressing rings
are positioned coaxially encircling each nested substrate, said annular
dressing rings are removably attached to said lower surface of [a
plurality of] said substrate [nesting support] head[s] assemblies, and

15 [compressing] means for simultaneously applying a polishing and dressing
pressure to said [coaxial polishing-dressing] head assemblies, whereby
the substrate [polishing-dressing] head assemblies are [pressed] urged
against the upper surface of the rotating polishing pad.

2. (AMENDED) The apparatus according to claim 1 wherein coaxially

combining said annular dressing rings with said [wafer] plurality of substrate head assemblies, simultaneously polishes all of said [wafer and] substrates while dress[es]ing said polishing pad.

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3. (AMENDED) The apparatus according to claim 1 wherein said polishing pad is treated with a suitable polishing slurry for polishing said [semiconductor wafer] substrates.

5. (AMENDED) The apparatus according to claim 4 wherein said [annular] dressing ring [substrate] material that makes contact with said polishing pad is [made of a] ceramic.

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6. (AMENDED) The apparatus according to claim 5 wherein said [annular dressing ring] ceramic portion making contact with said polishing pad [substrate] includes a glass frit binder.

7. (AMENDED) The apparatus according to claim [4] 6 wherein said [annular dressing ring] ceramic [substrate] portion making contact with said polishing pad has inclusions of sintered diamond abrasive[s].

8. (AMENDED) The apparatus according to claim 1 wherein coaxially combining said [annular] dressing ring [on] with said [coaxial polishing-dressing] substrate head assembly [on a CMP machine] eliminates the need of a separate dressing station.

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9. (AMENDED) The apparatus according to claim 8 wherein eliminating the need of a separate dressing [head] station[s for] increases[ing] machine throughput.

50 10. (AMENDED) The apparatus according to claim 1 wherein coaxially combining said [annular] dressing ring with said substrate head assembly improves polishing uniformity and process stability.

11. (AMENDED) The apparatus according to claim 1 wherein coaxially combining said [annular] dressing ring with said [wafer supporting] substrate head assembly simplifies the structure of the machine while improving maintainability.